

**Department of Environmental Conservation  
Division of Environmental Health**

**Alaska Railroad Corporation  
Application for  
Permit to Use Pesticide  
for Vegetation Management  
on the Railroad Right-of-Way  
Between Clear and Fairbanks**

**Public Noticed  
January 12, 2012 – March 12, 2012**

**RESPONSIVENESS SUMMARY  
June 15, 2012**

## Acronyms and Abbreviations

AAC	Alaska Administrative Code
AMPA	Aminomethylphosphoric acid
ARRC	Alaska Railroad Corporation
DEC	Alaska Department of Environmental Conservation
EPA	United States Environmental Protection Agency
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FRA	Federal Railroad Administration
IRIS	Integrated Risk Information System
LC50	Concentration lethal to 50% of exposed organisms
mg/L	Milligrams per liter
MSDS	Material Safety Data Sheet
NPDES	National Pollutant Discharge Elimination System
ODEQ	Oregon Department of Environmental Quality
ppm	Parts per million
POEA	polyethoxylated tallow amine
UAF	University of Alaska - Fairbanks
USDA	United States Department of Agriculture
USGS	United States Geological Survey

## INTRODUCTION

### Summary of Project

On November 10, 2011, DEC received a pesticide use permit application from the Alaska Railroad Corporation (ARRC) to apply herbicide for the purpose of vegetation management on the Railroad right-of-way between Clear and Fairbanks. Additional documentation was provided on November 23, 2011.

The ARRC proposes to apply AquaMaster Herbicide, Environmental Protection Agency Registration Number 524-343, with active ingredient glyphosate; and Agri-Dex, a non-ionic surfactant and spray oil. These products are widely available and used by homeowners and other casual users; a permit is required in this case because the proposed application will occur on state-owned land.

The mixture is proposed to be applied by a licensed contractor, DeAngelo Brothers Incorporated, under the direct supervision of an ARRC representative certified by the state of Alaska as a pesticide applicator. Applications will be made using low pressure and large droplet size techniques from a track mounted spray vehicle with nozzles two to three feet off the ground. Back-pack sprayer applications may also be used, with a pressure of 30-40 psi.

The ARRC proposes to apply herbicide to a 16 foot wide strip of the Railroad right-of-way on approximately 60 miles of track between Clear and Fairbanks.

Although the proposed products are approved for application directly to water, the ARRC proposes to spray only terrestrial portions of the track. Within the treatment area, a 25 foot buffer zone around water bodies has been proposed. Data from a UAF study on the environmental fate and transport of glyphosate indicate that the maximum possible drift or transport of glyphosate using the proposed methods is 25 feet (Barnes, 2010).

To ensure correct application of pesticides within the treatment area, the ARRC proposes to identify spray areas and buffer zones using yellow and blue paint. In addition, an ARRC representative will accompany the contractor at all times to ensure that the application vehicle is aware of upcoming buffer zones and to modify spray areas if necessary.

Signs containing information about upcoming pesticide applications will be posted prior to pesticide application. These signs will list the pesticide to be applied and the potential dates for application. It will also include a telephone number and website address where interested people can find current information about the specific dates when application occurs, which will be dependent on weather and other conditions. These signs will be posted at all road crossings within the proposed treatment areas, as well as nearby depots, and train cars serving flag stop passengers. Once spraying is initiated, the signs, website, and telephone line will be updated with the specific dates when spraying was conducted.

The ARRC states in the application that use of herbicide is necessary to control vegetation which obscures visibility along the tracks. Federal regulations require that the track be visible to allow inspection of the rails, ties, and fasteners. Vegetation also increases degradation of the track

structures and creates slip, trip and fall hazards for ARRC employees performing job related activities. ARRC has been issued repeated fines by the Federal Railroad Administration (FRA) for lack of vegetation control along the railway.

### **Opportunities for Public Participation**

Notice of the permit application was published in the Fairbanks Daily News Miner on January 12 and 13 of 2012. Notice included information about a public hearing and the opportunity to submit comments on the permit application. DEC also posted the public notice online at [www.state.ak.us/dec/eh/pest](http://www.state.ak.us/dec/eh/pest) and [www.dec.state.ak.us/public\\_notices.htm](http://www.dec.state.ak.us/public_notices.htm).

The 60 day public comment period for the permit application began on January 12, 2012, and ended March 12, 2012. DEC received written comments from 73 individuals within the comment period. A public hearing was held in Fairbanks on January 31, 2012. No one provided testimony at the public hearing.

DEC reviewed all comments received during this process. DEC's responses to these comments are presented in this document.

### **Decision Process and Purpose of Responsiveness Summary**

The purpose of this document is to respond to comments received during the public comment period. Detailed information regarding DEC's evaluation of the permit application, as well as scientifically-based evidence to support DEC's decision, is included in a separate Decision Document. In its decision, DEC considers whether the proposed pesticide use complies with requirements of Title 18, Chapter 90 of the Alaska Administrative Code (18 AAC 90), and whether the proposed use could result in an unreasonable adverse effect, including an unreasonable risk to human, animals, or the environment, taking into account the economic, social, and environmental costs and benefits of the use of a pesticide.

The following pages provide information about DEC's decision process, a summary of the comments that were submitted by one or more individuals during the public comment period, and DEC's response to those comments.

### **Pesticide Product Registration Process**

Before manufacturers can sell pesticides in the United States, the Environmental Protection Agency (EPA) evaluates the pesticides thoroughly to make sure they can be used without posing harm or "unreasonable adverse effects" to human health or the environment.

Pesticide products must undergo rigorous testing and evaluation prior to registration approval. EPA scientists and analysts carefully review data to determine whether to register a pesticide product, and whether specific restrictions are necessary. EPA uses internal and external reviews involving peers and the public through a comment process when conducting these evaluations.

The scientific data requirements for product registration are very detailed. Required data includes characterizations of the pesticide's chemistry and manufacturing process; mammalian and ecotoxicology; environmental fate; residues in or on human and livestock food or feed crops; applicator, occupational, and bystander exposures; product efficacy; and incident reports.

Registrants can be required to conduct and submit up to 100 or more individual scientific studies for the registration of a new pesticide.

By definition, all pesticides are toxic to some degree. The level of risk from a pesticide depends on how toxic or harmful the substance is, and the likelihood of people coming into contact with it. Uncertainty factors are built into the risk assessment. These factors create an additional margin of safety for protecting people who may be exposed to the pesticides.

In order for a pesticide to be registered, the EPA must determine that the product can be used as labeled without causing unreasonable adverse effects to humans or the environment. If risks or concerns are identified, appropriate risk mitigation measures are required. These are implemented through product label requirements, which may include reductions in application rates, restrictions to approved sites or commodities, advisory statements, implementation of specific management practices, and other restrictions or limitations designed to mitigate risk.

The proposed product label must provide the active pesticide ingredients, application directions, use restrictions, and warnings. This label information is based on the underlying scientific data and conclusions about potential hazards, exposures, and risks from use according to the label.

EPA also conducts regular reassessments of currently registered pesticides. Through this re-registration program, EPA assesses new scientific studies and information about registered products. If there is new evidence documenting unreasonable risk to human health and the environment, the allowed usage is modified and the label changed. When EPA identifies data gaps, new studies are required and reviewed.

If new information or studies show that a pesticide represents an unreasonable risk even after a change of allowable usage, EPA has the authority to cancel registration of products containing that pesticide. Whenever EPA determines there are urgent human and environmental risks from pesticide exposures that require prompt attention, EPA will take appropriate regulatory action, regardless of the registration review status of that pesticide.

EPA's extensive analyses of each pesticide product, and incorporation of new scientific data regarding safety and use of existing products, is sufficient to protect human health and the environment from unreasonable adverse effects. There is no data indicating a different impact in colder climates or environments from the proposed product. In fact, local studies show that the proposed products behave as expected in Alaska. Therefore DEC has no indication that additional restrictions are necessary with the proposed products. The EPA evaluation and registration process is sufficient to ensure no unreasonable adverse effects should be expected from the proposed use of pesticides specified in the permit application for ARRC.

## RESPONSE TO COMMENTS

### 1. Comment Summary:

Several comments related to identification of surface water were submitted. Statements included:

- Affected water bodies are not adequately identified.
- The aerial photos of the treatment area are outdated (from 2008).
- The public has no way of knowing if the water bodies will be properly identified and the correct buffer adhered to.
- The permit application was incomplete because it did not list affected water bodies, as required by 18 AAC 90.515(8)(D).
- Once the spray areas and buffer zones have been marked, DEC should establish a procedure to allow individuals to weigh in on the proposed spray areas and to identify areas of concern that should not be sprayed that have not been correctly identified.

### Response:

18 AAC 90.515(8)(D) requires that pesticide use permit applications identify each potentially affected surface water or marine water body within 200 feet of the treatment area. The application contained aerial photographs which depicted major water bodies. In addition, and more importantly, the ARRC has proposed that a licensed applicator precede application equipment at all times to identify any water bodies and mark the appropriate buffer zones to ensure that surface water bodies are identified and the proposed 25 foot buffer is adhered to.

The area to be sprayed includes numerous bodies of water, both large and small, many of which are seasonal. The proposed method of identifying water features on the ground is a more thorough approach, and will provide more protection for surface water than requiring a list of potentially affected water bodies. DEC is satisfied that the identification of water bodies in the application materials and the process for pre-marking all surface water bodies immediately prior to application ensures that all surface water bodies will be adequately identified.

### 2. Comment Summary:

The public is not able to provide informed comment prior to the decision on issuing the pesticide permit because the water bodies and specific areas to be sprayed are not identified in the permit application.

### Response:

The permit application contains adequate information about the proposed spray area, with detailed maps showing mile markers and the extent of possible spray areas. While some areas within the identified spray areas are likely to be excluded due to the presence of surface water, the information contained in the application provides sufficient detail to inform the public of potential treatment areas.

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**3. Comment Summary:**

Governor Jay Hammond prohibited the use of herbicides by state agencies in 1978. This ban still applies.

**Response:**

DEC has followed the current applicable statutes and regulations in evaluating this permit. The directive issued by Governor Hammond in 1978 does not carry the weight of law. In addition, this directive was issued in 1978 at a time when the knowledge of the potential effects of pesticides was much more limited. There has been a significant increase in the amount of research conducted since 1978 that has improved knowledge about the effects of the use of pesticides.

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**4. Comment Summary:**

The proposed project would require a National Pollutant Discharge Elimination System (NPDES) permit because of the potential damage to water quality.

**Response:**

As stated in response to Comment Summary 1, no water bodies will be present within 25 feet of the proposed spraying areas. A NPDES permit is not required in this situation.

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**5. Comment Summary:**

The proposed project would be a violation of a person's fundamental rights, because individuals near the proposed spray areas would not be able to avoid exposure to pesticides.

**Response:**

See response to Comment Summary 7. DEC is satisfied that the measures to provide notification will be sufficient to allow interested individuals to be informed about when and where spraying will occur, and has occurred.

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**6. Comment Summary:**

Several comments related to the public notice regarding the permit application for this project. Statements included:

- The public notice was inadequate.
- Newspapers are no longer widely read.
- Each property owner in the affected area should be directly contacted.
- Each community in the area should be directly contacted.
- There should be public hearings in each affected community.
- The public hearing should not have been scheduled on the same night as the Railroad Open House.
- The public hearing should have been held during better weather conditions to allow more people to attend.

**Response:**

Regulation requires that public notice be posted in a newspaper of general circulation in the affected area (18 AAC 15.050). This requirement was met for this permit application by posting public notice in the closest widely circulated newspaper, the Fairbanks Daily News Miner. In addition, DEC posted the public notice on the DEC website in two separate locations; the main public notice page and the Pesticide Program public notice page. The public notice was also posted on the ARRC website.

While a 30 day public comment period is normally provided for pesticide permits, this comment period extended for 60 days to allow ample time for public to prepare and submit comments.

Regulations require that a public hearing be held if requested by the affected municipality or by 50 or more residents of the affected area (18 AAC 15.060). Although requests for a public hearing were not received, a public hearing was held in Fairbanks on January 31, 2012. No one provided official testimony at the public hearing.

These efforts exceed the regulatory requirements. Furthermore, DEC is satisfied that all affected parties had sufficient opportunity to become informed about the proposed permit and provide comments to DEC.

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**7. Comment Summary:**

Several comments were made related to the need to provide public notice or posting of spraying, including:

- The ARRC should post written notice of the time and location of spraying.
- Posting of written notice is required by statute when broadcast herbicides are applied in public places.
- The ARRC must install warning signs for each spray area.
- DEC should require the ARRC to make the spray records available to the public immediately after application occurs.
- The ARRC should maintain a website with spray information, and update it within 24 hours.

**Response:**

The Railroad right-of-way does not meet the definition of a public place, which entails specific posting requirements. Nor would it be feasible to post notices along the entire right-of-way.

However, the permit will include a stipulation that notices (signs) containing information about upcoming pesticide applications be posted prior to pesticide application. These signs will list the pesticide to be applied and the potential dates for application. It will also include a telephone number and website address where interested people can find current information about the specific dates when application occurs, which will be dependent on weather and other conditions. These signs will be posted at all road crossings within the proposed treatment areas, as well as nearby depots, and train cars serving flag stop passengers.



Once spraying is initiated, the signs, website, and telephone line will be updated with the specific dates when spraying was conducted. As a result of these requirements, individuals will be able to find out information about where spraying has occurred through posted signs, by calling a telephone number, or by looking at the website.

DEC is satisfied that these measures will be sufficient to allow interested individuals to be informed about when and where spraying will occur, and has occurred. Individuals who wish to remain away from the treated areas will have the necessary information to do so.

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**8. Comment Summary:**

DEC should require the ARRC to consult with them each year and modify or eliminate additional treatments based on results of previous use.

**Response:**

The permit will stipulate that no spraying be conducted on areas that are bare of vegetation.

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**9. Comment Summary:**

The application was incomplete because a narrative explaining the adequacy of the buffer zone between the proposed spray areas and surface water bodies was not included.

**Response:**

A narrative providing this information was included as Attachment Six of the application. This narrative explains that no buffer zone is legally required, as the proposed product is approved for application directly to water. However, in interest of being conservative and providing additional protections for surface water, the application specified that pesticide would not be sprayed within 25 feet of any surface water body. Data from a UAF study on the environmental fate and transport of glyphosate indicate that the maximum possible drift or transport of glyphosate using the proposed methods is 25 feet (Barnes, 2010).

A description of the pesticide application process and methods for ensuring pesticide would not be sprayed near surface water was included. DEC is satisfied that the information provided meets application requirements.

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**10. Comment Summary:**

There should be a railroad vegetation management advisory council.

**Response:**

DEC evaluates each pesticide use permit application to determine if it could cause unreasonable adverse effects. There is no regulatory requirement for advisory councils.

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### **11. Comment Summary:**

Regulations don't require the ARRC to submit spray logs to DEC until 90 days after the five year permit expires. This does not allow corrective measures until after all spraying is completed. There is no requirement to note the specific locations that were sprayed.

#### **Response:**

The permit will stipulate that spray records must be submitted annually; these records must include details about the treatment location. DEC will also periodically inspect the herbicide application activities while they are occurring.

### **12. Comment Summary:**

EPA evaluation and registration of pesticides is not adequate or does not ensure the safety of pesticide products, or protection of fish, wildlife, or waters of Alaska. EPA assessments of biological risk can be off by a factor of 10,000 (Porter, 2005).

#### **Response:**

The EPA evaluation and registration process is discussed in detail in the Introduction of this Responsiveness Summary and in the Decision Document. EPA assessments are designed to over predict toxicity and risk. DEC feels that the EPA evaluation and registration process is adequate to protect human and ecological health for the proposed products.

### **13. Comment Summary:**

Independent reviews of products should be conducted before use. Monsanto, the maker of AquaMaster, is in the business to sell products, so their claims that the product is safe cannot be trusted.

#### **Response:**

EPA requires extensive testing prior to approving registration of a pesticide product. The EPA evaluation and registration process is discussed in detail in the Introduction of this Responsiveness Summary and in the Decision Document. EPA assessments are designed to over predict toxicity and risk. DEC feels that the EPA evaluation and registration process is adequate to protect human and ecological health for the proposed products.

### **14. Comment Summary:**

The EPA is currently conducting a registration review for glyphosate. Statements included:

- This is evidence that the pesticide may be more dangerous than previously thought.
- The current label instructions may not be adequate to ensure safety.
- EPA has not reviewed glyphosate since 1993, and there is substantial new evidence that is being evaluated in this review.
- There are data gaps that will be addressed in the new risk assessment.

**Response:**

A registration review is being conducted by the EPA, but this is not evidence that the pesticide may be more dangerous than previously thought. The registration review officially began in 2008 as part of a FIFRA requirement to re-evaluate the registration of pesticides every 15 years. It is true that there are many new studies available for the EPA to review. However, the fact that such a review is ongoing does not impact the current permit application. DEC has reviewed a number of articles and studies developed since 1993 as part of the permit decision.

EPA has the ability to modify the allowed uses or cancel registration of a product if there is new evidence documenting unreasonable risk to human health and the environment. The EPA has not done so with glyphosate.

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**15. Comment Summary:**

Several comments expressed concern over transport of glyphosate to water bodies. Statements included:

- The proposed buffer is not adequate to protect wetlands, streams, or lakes.
- Buffer zones should be at least 200 feet.
- Glyphosate will travel downhill.
- Glyphosate and its degradates are commonly found in rivers and streams.
- Glyphosate can be carried to water by soil particles suspended in run off.
- Glyphosate can contaminate water via runoff, leaching, and drift.
- Glyphosate can contaminate surface water because it is not broken down readily by water or sunlight.
- Not all anadromous streams or feeder streams have been cataloged.  
(US Forest Service 2000; Benachour, 2009; Gasnier, 2008)

**Response:**

Based on scientific review of the potential impacts, the EPA has approved AquaMaster to be applied directly to water for control of vegetation in aquatic settings. The ARRC has chosen to apply only to terrestrial areas at least 25 feet from water. Data from a UAF study on the environmental fate and transport of glyphosate indicate that the maximum possible drift or transport of glyphosate using the proposed methods is 25 feet.

Pesticides will be applied close to the ground by a slow moving vehicle during periods of low wind. In accordance with the product label, it also may not be applied in heavy rain. These measures will prevent significant aerial drift or runoff during application.

Glyphosate adsorbs strongly to soil particles, and is either taken up by plants or degraded by microorganisms, making it unavailable for dispersion after application. Water and sunlight are not a significant degradation pathway for glyphosate, but it is readily, and fairly rapidly, broken down by microorganism in soil and water. Once in the soil, it degrades relatively rapidly and is not considered to be persistent. These characteristics make it unlikely to be transported or to leach through soil to groundwater.

In water, glyphosate also adsorbs strongly to sediments. These sediments, and any glyphosate attached to soils that runoff into water bodies, are either taken up by plants or degraded by microorganisms, making it unavailable for dispersion after application. These characteristics make it unlikely to have significant impact to water bodies.

The ARRC has proposed to apply pesticide only in specific sections of track that do not contain any visible surface water within 25 feet. A licensed applicator will precede application equipment at all times to identify any water bodies and mark the appropriate buffer zones to ensure that surface water bodies are identified and the buffer is adhered to.

DEC is satisfied that the identification of water bodies in the application materials and the process for pre-marking all surface water bodies immediately prior to application ensures that all surface water bodies will be adequately identified.

Furthermore, DEC is satisfied that the proposed 25 foot buffer zone, in conjunction with application methods and pesticide characteristics, is adequate to prevent pesticide product from impacting water resources.

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**16. Comment Summary:**

Glyphosate and its degradate AMPA are found in rain, rivers, and air in agricultural areas  
(Coupe, 2011; Chang, 2011)

**Response:**

Both cited documents examined the fate and transport of glyphosate in agricultural basins where glyphosate use is extremely high. The limited quantity to be applied under the proposed permit does not pose the same kinds of risks.

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**17. Comment Summary:**

Several comments were received regarding the persistence of glyphosate. Statements included:

- Glyphosate and its degradates are known to be persistent in soils and sediments after application.
- Glyphosate and other herbicides are known to be more persistent in northern climates, including Finland, Sweden, and Canada.
- AMPA, the primary degradate of glyphosate, is known to persist for longer than glyphosate.

(Muller, 1981; Feng, 1990; Roy, 1989; Torstensson, 1989; Relyea, 2005; McInnis, 2003; Simenstad, 1996; US Forest Service, 2000)

**Response:**

Glyphosate is not particularly persistent, even in northern climates such as Finland where conditions rival those in parts of Alaska. The National Pesticide Information Center lists glyphosate as low to moderately persistent in soil.

The most common environmental breakdown product of glyphosate is AMPA, primarily in soil, which is produced by bacteria eating the chemical. A secondary breakdown product results in the formation of an amino acid called glycine (US Forest Service, 2000). The environmental half-life of AMPA ranges between 7 and 14 days in water (US Forest Service, 2000), and about 32 days in soil (Simonsen et al., 2008), so the breakdown product does not persist. One of the intermediate breakdown products of AMPA is formaldehyde, which is further metabolized by bacteria to carbon dioxide. The formaldehyde does not persist in the environment, and exposure is anticipated to be minimal due to the short period over which breakdown of AMPA occurs. While AMPA is slightly more toxic than glyphosate, it is present in lower concentrations than the parent compound and degrades slightly slower than glyphosate, which has a soil half-life of 9 days; (Simonsen et al., 2008). Therefore, potential risk from exposure to AMPA should not be any greater than that from exposure to glyphosate. In both cases, this should be well below any levels that might cause unreasonable adverse effects.

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#### **18. Comment Summary:**

Page 1 of Appendix 6 of the application shows dead vegetation that is greater than 4 feet from the centerline, which shows that the ARRC sprayed beyond the target area specified in the permit (10-SOL-01), or that the pesticide migrated beyond the sprayed area.

#### **Response:**

A careful review of the referenced photo does not show dead vegetation beyond the ends of the railroad ties. The photo shows a clear line of demarcation along the edge of the railroad ties.

Furthermore, a DEC pesticide enforcement officer inspected the treated areas one month after application of pesticides made under pesticide use permit #10-SOL-01, and wrote a detailed description of observations. The observation Memorandum, supported by photographs, notes that there was a clear line of demarcation along the edge of the spray area; most vegetation within the spray area was dead or browning, and vegetation outside of the sprayed areas was green and showed no signs of pesticide impact. Observations were made in the Seward Railyard and at several locations along the right-of-way. The effects of the herbicide were limited to the permitted spray area in all areas observed.

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#### **19. Comment Summary:**

People will be exposed to pesticide drift and volatilization of herbicide vapors for days after application. There is potential for wind borne spread of the chemicals.

#### **Response:**

Significant aerial drift is not anticipated during or after application. Pesticides will be applied close to the ground by a slow moving vehicle during periods of low wind, reducing chance for aerial drift during application. Glyphosate adsorbs strongly to soil particles, and is either taken up by plants or degraded by microorganisms, making it unavailable for dispersion after application.

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**20. Comment Summary:**

Several comments were received regarding the adequacy of the ongoing UAF study on persistence and mobility of herbicides along the ARRC railway. Statements included:

- A permit should not be issued before the study is complete.
- The study has provided very limited data that are insufficient for making conclusions.
- The study was poorly designed and does not represent adequate scientific documentation.
- The study has inaccurate results because it tested glyphosate alone without the surfactant, which would impact behavior of the pesticide.
- The study did not assess the movement of herbicide beyond the ballast.
- The study did not assess bioavailability, uptake, effects on non-target species, biological, or human health effects.

**Response:**

Characteristics and behavior of glyphosate products have been widely studied and are well understood. UAF is in the process of conducting additional studies to determine if these characteristics are affected by conditions in local environments.

The UAF study on persistence and mobility of herbicides along the ARRC railway and other locations was designed and is being carried out by Dr. David Barnes, Chair of the Water and Environmental Research Center at UAF. In their study, they applied AquaMaster Herbicide mixed with the surfactant Agri-Dex (the same products to be used in the proposed project). The study also applied the Oust Extra herbicide. Samples of soil and water were taken at various times after application of pesticides.

The UAF study has not yet been completed and published. However, the results to date from this ongoing study provide substantial documentation that the behavior of the proposed products, including persistence and mobility, does not vary significantly from that in warmer climates. As such, this documentation is considered adequate for the purposes of the permit application.

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**21. Comment Summary:**

Several comments were received regarding the results from the ongoing UAF study on persistence and mobility of herbicides along the ARRC railway. Statements included:

- The study showed that glyphosate migrated to the ground water.
- The study showed that glyphosate was found in root zone soils at day seventy-nine.

**Response:**

Soil samples, taken at various distances below the soil surface in the treatment site, show that concentrations of glyphosate in the soil drop off quickly in the days after application. Seventy-nine days after application, the maximum concentration of glyphosate found in soils was 0.18 milligrams of glyphosate per kilogram of soil. This is a very small amount, roughly equivalent to 3.5 drops of glyphosate in a ton of soil. This amount was measured in root zone soils, or about four inches below the surface.

Soil samples were taken at various distances away from the treatment site one week after application, including within the sprayed area, and 3 feet, 6 feet, 10 feet, and 12 feet away from the sprayed area. The test results from these samples show that after one week, only minute quantities of glyphosate or its degradate AMPA were present outside of the treatment area. Most samples taken 10 to 12 feet away from the spray areas showed no detectable levels of glyphosate. One soil sample taken 12 feet from the spray areas showed the presence of 0.12 mg/kg of glyphosate. This is equivalent to just over 2 drops of glyphosate in a ton of soil.

Water samples taken from ground water wells located between the rails and directly below the application area, showed minute concentrations of glyphosate, with levels generally undetectable after 80 days. The maximum concentration measured in ground water was 0.017 milligrams per liter of water, measured 9 days after application. This is equivalent to 1.4 drops of glyphosate in 1,000 gallons of water.

These measured amounts are extremely low, and much less than any levels that might cause health effects in humans. The EPA dietary reference dose for glyphosate has been determined to be 2 mg/kg/day. The reference dose, based on toxicity studies, represents the amount that can safely be ingested each day over a lifetime without causing adverse health effects. For glyphosate, an average adult male, weighing 200 pounds (~90 kilograms), could ingest 180 milligrams of glyphosate each day for a lifetime without any adverse health effects. Based on the amount of glyphosate measured in ground water in the UAF study (0.017 milligrams per liter), this person would need to drink 10,588 liters (2,794 gallons) of this water each day to reach a level that might cause adverse health effects.

The UAF study has not yet been completed and published. However, the results to date from this ongoing study provide substantial documentation that the behavior of the proposed products, including persistence and mobility, does not vary significantly from that in warmer climates. As such, this documentation is considered adequate for the purposes of the permit application.

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## **22. Comment Summary:**

A previous study conducted by UAF shows that herbicides increase in concentration in Alaska following spring thaw.

### **Response:**

A 1991 UAF study was not related to glyphosate. The study did find that 2,4-D and triclopyr increased in concentrations in soils following spring thaw. However, glyphosate has no structural similarity with these herbicides, and therefore behaviors of these products are not similar. The results of the referenced studies cannot be applied to glyphosate products. 2,4-D and triclopyr are both chlorinated phenoxy herbicides, while glyphosate is a derivative of the amino acid glycine, with no chlorine on the molecule. Presence of chlorine tends to increase persistence and toxicity of chemicals over similar chemicals without chlorine (Tilsworth, 1991).

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**23. Comment Summary:**

The use of chemical weed control is not necessary because effective alternative methods are available. Statements included:

- Alternative methods include hot water, infra-red, steam, flame throwers, competing vegetation, cutting, girdling, mowing, geo-textiles, grazing animals, acids, ballast replacement, corn-gluten, and organic/non-toxic weed killers.
  - Alternative methods are being developed and/or used in Canada and Europe.
  - Alternative methods have not been sufficiently analyzed.
  - Alternative methods have not been adequately implemented.
  - The ARRC has not provided information about relative costs of the various control methods.
  - The ARRC has not evaluated alternative methods in over ten years, and there are new developments.
  - DEC cannot find that there are no feasible alternatives to herbicide.
  - Manual cutting could create jobs and/or utilize prison workers.
  - The ARRC should adopt an integrated pest management plan.
  - The ARRC has received significant federal funding which should be used to invest in non-chemical vegetation control.
  - The ARRC should have to prove that alternative methods don't work before they can use pesticides.
- (Burnham, 2003; Lamming, 2001; Ministry of Environment)

**Response:**

A narrative explaining the need to apply pesticides was included as Attachment One of the application. This justification included a description of alternative methods for controlling vegetation that have been attempted, and documentation that these methods have proven ineffectual. The ARRC does have a significant history of attempting to manage vegetation using a number of non-chemical methods, and in spite of these efforts, vegetation management has not been adequate in the opinion of the FRA. Most railroads in the United States and Canada use herbicides as part of vegetation management. Complete vegetation control is required by Federal law, and the ARRC provided a warning letter and inspection reports issued by the FRA related to inadequate vegetation control (US DOT, 2009; Page, 2011).

DEC considered these and other factors in making its determination that the activities contemplated under the permit application will result in no unreasonable adverse effect.

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**24. Comment Summary:**

Several comments related to the need to use herbicides were submitted. Statements included:

- The ARRC does not adequately justify the use of herbicides.
- The ARRC has not received any fines due to vegetation "as of July, 2006".
- The ARRC has neglected vegetation management using alternative methods in order to justify herbicide use.
- The ARRC has successfully controlled weed growth without the use of pesticides since 1983.



**Response:**

A narrative explaining the need to apply pesticides was included as Attachment One of the application. The ARRC does have a significant history of attempting to manage vegetation using a number of non-chemical methods, and in spite of these efforts, vegetation management has not been adequate in the opinion of the FRA. Most railroads in the United States use herbicides as part of vegetation management. Vegetation control is required by Federal law, and the ARRC provided a warning letter issued by the FRA related to inadequate vegetation control (US DOT, 2009). ARRC has been issued repeated violations and fines by the Federal Railroad Administration (FRA) for lack of vegetation control along the railway. DEC considered these and other factors in making a determination regarding the proposed project.

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**25. Comment Summary:**

There is substantial evidence that glyphosate is harmful to human health. These effects can occur even at very low doses. Serious health effects on humans and other animals include:

- various cancers
- miscarriages and late abortion
- attention deficit disorder
- learning disabilities
- reduced production of sex hormones
- neurological effects
- damage to liver, kidney, and other organ health
- impacts to the immune system
- damage to developmental processes including development of the brain and skeleton
- impacts to enzymes in the liver and intestines
- birth defects
- disruption to DNA transcription
- damage to reproductive health and behavior
- harm to semen quality and lowered sperm counts
- impaired growth and development
- eczema
- skin lesions
- Parkinsonian syndrome
- respiratory problems
- elevated blood pressure
- allergic reactions
- genetic damage, damage to DNA, or mutagenic effects
- impacts to sexual development
- rhinitis

(American Cancer Society; Arbuckle 2001; Barbosa 2001; Dallegreave 2003; DeRoos 2003; DeRoos 2005; Eriksson, 2008; Frontera 2011; Garry, 2002; Gasnier 2008; Hardell, 1999; Hardell 2002; Hietanen 1983; Kavlock, 1996; Marc, 2005; Marco, 1998; Porter 2004; Porter, 2005; Porter, 2010; Romano, 2011; Sanborn 2004; Slager, 2009; Walsh 2000)

**Response:**

In order for human health to be adversely impacted, there must be both a complete exposure pathway which could lead to a dose, and there must also be toxicity significant enough to cause an adverse reaction.

Exposure

Pesticides will be applied close to the ground by a slow moving vehicle during periods of low wind, which will prevent significant aerial drift during application. Glyphosate adsorbs strongly to soil particles, and is either taken up by plants or degraded by microorganisms, making it unavailable for dispersion after application. Any potential exposure would be limited to the immediate application area.

Individuals who would be present during pesticide application will all be Certified Applicators, or under the supervision of a Certified Applicator. Certified Applicators are trained and tested to ensure they are competent to safely and effectively apply pesticides.

The AquaMaster label does not specify a re-entry interval, meaning that EPA does not consider it a risk to enter the treated immediately after application. Even immediately after spraying, only very insignificant exposures would be expected to result from entering the spray area

For railroad users, DEC is satisfied that the measures to provide notification (described in response to Comment Summary 7) will be sufficient to allow interested individuals to be informed about when and where spraying will occur, and has occurred. Individuals who wish to remain away from the treated areas will have the necessary information to do so.

Regarding the potential for exposure, DEC is satisfied to that the potential for exposure to the proposed pesticide is limited, both during and after application, and does not provide an exposure pathway that could lead to significant exposure that might result in toxic effects.

Toxicity

Toxicity categories are assigned to pesticides based on their ability to cause harm by various routes of exposure (oral, dermal, inhalation, etc.) There are four categories, with Category I being the most toxic, and Category IV the least toxic, listed as “practically non-toxic”. AquaMaster is listed by EPA as Category IV, the least toxic.

This product has been extensively studied and its low toxicity has been documented across many species in multiple studies. Glyphosate works by inhibiting an enzyme that enables the plant to produce proteins necessary for plant growth and survival. The enzyme and protein production process are found only in plants, not in animals, which limits the effects of glyphosate herbicides on organisms other than plants (US Forest Service, 2000; Williams, 2000).

As described above under “Pesticide Product Registration Process”, EPA considers all known information through their registration review, which includes an extensive analysis of each pesticide product. If there is new evidence documenting unreasonable risk to human health and the environment, the allowed usage is modified and the label changed. When EPA identifies data

gaps, new studies are required and reviewed. EPA also has the authority to cancel registration of products containing that pesticide.

It is true that most of the research is conducted on laboratory animals as opposed to humans. However, this does not invalidate the importance of animal data. Most of the human-based information is either from case studies or in vitro studies (some of which were cited by commenters). No epidemiological study has been conducted linking any of the above health effects in humans with exposure to glyphosate. The references cited by commenters were reviewed; however, many of the references do not provide documentation of their claims that can be directly confirmed. Others are case studies, in vitro studies, or animal studies.

Based on a review of available information, while certain formulations that contain glyphosate appear to cause toxicity as described in several studies, toxicity is primarily or entirely attributable to the adjuvants in the formulation, and not to glyphosate. Since these glyphosate formulations or adjuvants are not proposed for use under this permit, these studies are not directly relevant to the application. AquaMaster contains only glyphosate and water, and Agri-Dex does not contain POEA or other ingredients linked to the studied problems.

Human data from peer-reviewed scientific journal articles are summarized in an Herbicide Fact Sheet prepared by the National Pesticide Information Center, a joint service sponsored through the U.S. EPA and Oregon State University (NPIC, 2010). These studies are summarized below.

- Accidental or intentional poisonings in 93 cases of glyphosate ingestion. Effects included gastrointestinal irritation, hypotension, and lung dysfunction. Five people died.
- A study on ingestion poisonings of 56 people using glyphosate products indicated effects on the cardiovascular, pulmonary, and central nervous system, and nine people died. Researchers considered toxicity at least in part was due to other ingredients in the product.
- Eye exposure to 1514 people was evaluated for toxicity; 21 percent had no effects, and 70% had minor temporary effects. Two percent of those exposed suffered moderate damage that often required medical treatment. No one suffered permanent eye damage or loss of visual acuity.

Regarding the potential for cancer, glyphosate is listed by EPA's Office of Pesticide Programs Re-Registration Eligibility Document in cancer classification Group E (evidence of Noncarcinogenicity in Humans). Most chemicals that are unlikely to be carcinogenic in humans are assigned to Group D (Not classifiable regarding carcinogenicity), which is the classification used for glyphosate by EPA's Integrated Risk Information System (IRIS). The Group E categorization implies a strong weight of evidence that glyphosate is not carcinogenic.

Regarding the toxicity of the proposed product, DEC is satisfied that EPA's extensive analysis of each pesticide product, and incorporation of new scientific data regarding safety and use of existing products, is sufficient to protect human health. Concentrations present in the environment during or following applications are not anticipated to approach levels considered potentially harmful to human health.

Based on the limited exposure potential and the low toxicity to humans and other animals of the proposed product, DEC does not anticipate any adverse impacts to human health as a result of the proposed project.

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**26. Comment Summary:**

Glyphosate can enhance heavy metal toxicity (Gasnier, 2008).

**Response:**

The cited article discusses cytotoxicity, genotoxicity, and estrogenic activity in an in vitro human cell line. No data indicating enhancement of heavy metal toxicity in combination with glyphosate were presented. There is no evidence in scientifically recognized, peer-reviewed journal articles that glyphosate acts synergistically with any metal.

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**27. Comment Summary:**

Glyphosate is an endocrine disruptor, with serious impacts to human health including obesity, heart problems, and diabetes. These effects can occur as a result of very low concentrations. (Walsh, 2000; Porter 2005; Richard, 2005; Romano, 2011)

**Response:**

There is no human exposure expected due to the proposed project, either during or after application. Pesticides will be applied close to the ground by a slow moving vehicle during periods of low wind, reducing chance for aerial drift during application. Glyphosate adsorbs strongly to soil particles, and is either taken up by plants or degraded by microorganisms, making it unavailable for dispersion after application.

As described above under “Pesticide Product Registration Process”, EPA considers all known information through their registration review, which includes an extensive analysis of each pesticide product. If there is new evidence documenting unreasonable risk to human health and the environment, the allowed usage is modified and the label changed. When EPA identifies data gaps, new studies are required and reviewed. EPA also has the authority to cancel registration of products containing that pesticide.

Specific studies focusing on endocrine disruption of glyphosate are available but not numerous. Most consider specific formulations, which include additives and other ingredients not found in AquaMaster. For these studies, it is not clear if reported effects were due to glyphosate, the relatively more toxic inactive ingredients found in some formulations such as Roundup (but not in the proposed product), or the formulation itself. Given the effort focused on identifying endocrine disrupting compounds in glyphosate over the past several years, the lack of literature indicating potential endocrine disruption effects from glyphosate is strong negative evidence.

Given the current information on the toxicity of glyphosate, the likely environmental concentration following application, and glyphosate’s lack of mobility in the environment, health effects from glyphosate are not anticipated.

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## **28. Comment Summary:**

Glyphosate causes ‘total cell death within 24 hours’ (Benachour, 2009).

### **Response:**

The comment cites a 2009 article by Benachour which contains an evaluation of the effects of applying glyphosate directly to in vitro cells. When glyphosate was applied directly to in-vitro cells, the researchers found a number of effects, including endocrine disruption, inhibition of transcriptional activities, and cytotoxicity.

However, application of a substance directly to in-vitro cells does not reflect conditions that occur under normal application conditions. Environmental exposure concentrations of 20 ppm do not lead to concentrations within cells of 20 ppm. In fact, due to very low absorption of glyphosate by mammals (US Forest Service, 2000), very little chemical actually enters the body after exposure. This amount is further reduced through physiological processes that occur before cellular targets are reached. Therefore, while “total cell death within 24 hours” was reported, this study is not relevant for evaluating potential toxicity from concentrations that are normally applied.

## **29. Comment Summary:**

Glyphosate is toxic to human placental cells at levels below label recommendations. (Richards, 2005)

### **Response:**

The comment cites a 2005 article by Richards which contains an evaluation of the effects of applying normally glyphosate directly to lab grown human placental cells. When glyphosate was applied directly to these cells, the researchers found a number of effects, including reduced cell viability.

However, application of a substance directly to in-vitro cells does not reflect conditions that occur under normal application conditions. Environmental exposure concentrations of 20 ppm do not lead to concentrations within cells of 20 ppm. In fact, due to very low absorption of glyphosate by mammals (US Forest Service, 2000), very little chemical actually enters the body after exposure. This amount is further reduced through physiological processes that occur before cellular targets are reached. Therefore, while damage to fetal cells was reported, this study is not relevant for evaluating potential toxicity from concentrations that are normally applied.

## **30. Comment Summary:**

Glyphosate is responsible for acute agricultural worker poisonings.

### **Response:**

Toxicity categories are assigned to pesticides based on their ability to cause harm by various routes of exposure (oral, dermal, inhalation, etc.) There are four categories, with Category I being the most toxic, and Category IV the least toxic, listed as “practically non-toxic”.

Studies show that glyphosate has relatively low oral and dermal toxicity (EPA, 1993). AquaMaster is listed by EPA as Category IV, the least toxic.

Acute poisonings from glyphosate are rare. The only documented cases that DEC has identified, after consultation with the National Pesticide Information Center, were due to intentional ingestion of concentrated product.

Concentrated glyphosate can cause injury to skin or eyes. However, the only individuals that will be exposed to concentrated product for this project will all be Certified Applicators, or under the supervision of a Certified Applicator. Certified Applicators are trained and tested to ensure they are competent to safely and effectively handle and apply pesticides.

A diluted solution will be applied to the treatment area. Once the product is diluted with water, the amount of glyphosate to which humans may be exposed is well below any dose needed to result in acute toxicity.

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### 31. Comment Summary:

There were several comments related to the presence of public or workers on the railroad right-of-way, and flag stop users in particular, and their exposure to pesticides. Statements included:

- Public use of the railroad right-of-way is common; it is encouraged by the ARRC through their whistle stop and flag stop trips. These users will be exposed to herbicide.
- The application does not mention flag stop users and how they will be protected from involuntary exposure to pesticides.
- There should be a buffer of at least 500 feet from each flag stop.
- The public has no way of knowing if flag stops will be properly identified.
- The proposed project does not protect railroad workers.

### Response:

See response to Comment Summary 7. DEC is satisfied that the measures to provide notification will be sufficient to allow interested individuals to be informed about when and where spraying will occur, and has occurred. Individuals who wish to remain away from the treated areas will have the necessary information to do so.

See also response to Comment Summary 24. DEC is satisfied that that EPA's extensive analysis of each pesticide product is sufficient to protect human health. Concentrations present in the environment during or following applications are not anticipated to approach levels considered potentially harmful to human health.

=====

### 32. Comment Summary:

Studies show that farmers have glyphosate in their urine after applying the pesticide (Acquavella, 2004).

**Response:**

The cited study did find the presence of glyphosate in farmer's urine. The levels did not approach EPA reference dose. The reference dose, based on toxicity studies, represents the amount that can safely be ingested each day over a lifetime without causing adverse health effects. Levels were highest in those observed to violate mixing and handling precautions.

The only individuals that will be exposed to concentrated product for this project will all be Certified Applicators, or under the supervision of a Certified Applicator. Certified Applicators are trained and tested to ensure they are competent to safely and effectively handle and apply pesticides.

A diluted solution will be applied to the treatment area. Once the product is diluted with water, the amount of glyphosate to which humans may be exposed is well below any dose needed to result in acute toxicity. Concentrations present in the environment during or following applications are not anticipated to approach levels considered potentially harmful to human health.

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**33. Comment Summary:**

Humans could be exposed to pesticides by eating:

- The meat of game animals such as moose and grouse that feed along the railway.
- Fish caught near the railroad.
- Mushrooms, medicinal plants, or berries gathered along the railroad corridor.
- Crops in nearby farms and gardens.

**Response:**

Given the lack of mobility of glyphosate, any impacts will be limited to the immediate application areas, which include the track bed and right-of-way only. Any plant material that is sprayed will quickly die and no longer be available for consumption by humans.

Game animals are not an exposure pathway to humans for several reasons.

- The herbicide solution dries quickly and would not be ingested directly by game animals.
- Plants that are sprayed die and are no longer be available for consumption by game animals.
- Glyphosate has been shown to not bioaccumulate in animals – instead it is excreted unchanged (US Forest Service, 2000).

Fish are also not an exposure pathway to humans, primarily because no water bodies are expected to be impacted by the proposed project. The proposed 25 foot buffer zone, in conjunction with application methods, is adequate to prevent pesticide product from impacting any nearby surface water. See response to Comment Summary 15. In addition, as explained above, glyphosate does not accumulate in animals, including fish.

There is essentially no exposure route for humans to ingest pesticide under the suggested scenarios.

=====

**34. Comment Summary:**

The toxicity of glyphosate and surfactants is affected by environmental factors such as water hardness, temperature, and pH. (Henry, 1994, US Forest Service, 2000; Chen, 2004; Folmar, 1979)

**Response:**

It is correct that water hardness and pH influence the bioavailability, and hence the toxicity, of the products in water. Higher pH tends to be associated with higher toxicity (Chen, 2004) in Roundup and other formulations that contain glyphosate, due to the presence of the surfactant. The toxicity of glyphosate is increased in acidic conditions, which is the opposite effect of the surfactant. However, the proposed project involves use of AquaMaster, and does not involve application of herbicide to water, so these effects are not anticipated.

=====

**35. Comment Summary:**

There were a number of comments related to drinking water wells. Statements included:

- There needs to be better proof that there are no public or private wells within 200 feet of the spray area.
- Private wells may not be easily identifiable.
- The ARRC must contact each private residence along the railroad to determine if there are drinking water wells.
- Previous permit applications failed to identify private wells.
- Drinking water could be impacted by the proposed project.
- The City of Seward drinking water source is close to the proposed application area (direct quote from comment).

**Response:**

No public or private drinking water system has been identified within 200 feet of the proposed treatment area.

DEC is satisfied that the ARRC has identified any known drinking water systems to the best of their ability. There are no records regarding most private wells. As pointed out, private drinking water wells can be difficult to identify. Any private well owners within 200 feet of the railroad should contact ARRC to identify the location of their well.

The ARRC right-of-way is a minimum of 100 feet wide, extending 50 feet to either side of track center. Therefore, any private drinking water wells would be more than 40 feet away from the proposed spray area. Data from a UAF study on the environmental fate and transport of glyphosate indicate that the maximum possible drift or transport of glyphosate using the proposed methods is 25 feet (Barnes, 2010).

Glyphosate adsorbs strongly to soil particles, and is either taken up by plants or degraded by microorganisms, making it unavailable for dispersion after application. It is readily broken down by microorganism in soil and water, and is not considered to be persistent. These characteristics make it unlikely to be transported or to leach through soil to groundwater.



DEC is satisfied that the distance to any public or private water system, application methods, and pesticide characteristics are adequate to prevent pesticide product from impacting these systems, including drinking water wells.

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### **36. Comment Summary:**

There were several comments related to potential exposure of nearby neighborhoods. Statements included:

- The proposed project does not protect neighborhoods adjacent to tracks.
- Similar applications of this herbicide made by the ARRC in July, 2010 made no attempt to avoid spraying in areas where houses were within 100 feet of the track.

### **Response:**

There is no label requirement or other regulation that would prohibit application of the pesticide in proximity to homes or other properties. Products with this active ingredient are widely available and commonly used by homeowners within residential areas. The ARRC right-of-way is a minimum of 100 feet wide, extending 50 feet to either side of track center. Therefore, any private property should be at least 40 feet from the edge of the proposed spray areas.

Based on the limited exposure potential and the low toxicity to humans (see response to Comment Summary 24), DEC does not anticipate any adverse impacts to human health as a result of the proposed project.

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### **37. Comment Summary:**

Comments were received regarding the harmful/toxic effects of glyphosate to aquatic invertebrates, aquatic insects, tadpoles, salmon, and other fish, including:

- Herbicides harm aquatic invertebrates and tadpoles including impacts to neurological, endocrine, immune, and developmental process.
- Herbicides cause damage to aquatic invertebrates or plankton, which are food sources for salmonids and other fish, and can result in ecosystem collapse.
- Glyphosate causes genetic damage, developmental damage, and damage to the immune system of fish.
- Glyphosate causes intersex frogs
- Glyphosate causes damage to fish even at low concentrations, including inability to migrate, erratic swimming, gill damage, and changes to liver structure.
- Chronic exposure to glyphosate causes damage to fish, including changes in gill and liver structure, and impacts to the heart, kidney, and serum enzyme activity.
- Roundup products are extremely lethal to amphibians at environmental concentrations.  
(Gluszczak, 2011; Kreutz, 2010; Ortiz-Ordóñez, 2011; Bringolf, 2007; Liong, 1988; Neskovic, 1996; Lohn, 2003; Norris, 1991; Relyea, 2005; Giesey, 2000; Folmar, 1979; Diana, 2000; Spence, 1996).

### **Response:**

See response to Comment Summary 15. DEC is satisfied that the proposed 25 foot buffer zone, in conjunction with application methods and pesticide characteristics, is adequate to prevent

pesticide product from impacting surface water. Because no water bodies are expected to be impacted by the proposed project, no toxicity is expected to aquatic organisms.

Glyphosate itself is relatively non-toxic to fish, algae, aquatic invertebrates, and aquatic macrophytes (US Forest Service, 2000). Many of the toxic effects associated with commercial glyphosate formulations have been shown to be due to the presence of the surfactants rather than the glyphosate itself. The proposed product contains only glyphosate and water. As a result, the proposed product is considered safe, and is approved by EPA, for application directly to water. Even if the product was applied directly to water, toxicity to fish and other aquatic organisms would not be expected, since studies show that this product is classified as slightly to practically nontoxic to fish aquatic invertebrates (USEPA, 1993).

=====

**38. Comment Summary:**

The US Fish and Wildlife Service opposed aerial application of glyphosate for forestry in southeast Alaska, due to its potential for aquatic toxicity.

**Response:**

The project referenced in this comment proposed to use a different glyphosate product. That product included additional ingredients that had potential effects on aquatic ecosystems, and was therefore not approved by EPA for aquatic application.

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**39. Comment Summary:**

Biological effects of pesticides are unpredictable. (Porter, 2005)

**Response:**

Biological effects of pesticides are generally quite predictable once toxicity information is available indicating how the toxic effects are exerted in the body. Glyphosate has been extensively studied, and its low toxicity has been documented across many species in multiple studies.

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**40. Comment Summary:**

Glyphosate will eliminate a wide variety of non-target vegetation (Norris, 1991).

**Response:**

All vegetation in the proposed spray areas along the railroad right-of-way is targeted.

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**41. Comment Summary:**

Removal of vegetation that shades surface water will increase water temperatures, with negative impacts to salmon (Holtby, 1989).

**Response:**

See response to Comment Summary 15. Since surface water bodies will not be impacted, no effects on anadromous fish are expected. Pesticide will not be applied within 25 feet of any surface water body. Therefore, there will be no impacts to any vegetative shading of streams.

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**42. Comment Summary:**

Glyphosate impacts the health of soil by inhibiting nitrogen fixation, reducing fungus, and increasing disease susceptibility of plants (Eberbach, 1983; Estok, 1989; Brammal, 1988).

**Response:**

One study on fungi effects was identified in the literature (Estok, 1989), which evaluated fungi that grow on the outsides of the roots of plants (ectomycorrhizal fungi). Lower growth of the fungi was seen at concentrations as low as 1 part per million (ppm). However, in the absence of plants in the spray area, none of these types of fungi would be present. Therefore, no impacts on ectomycorrhizal fungi are expected.

Regarding effects on bacteria, one peer-reviewed agricultural field study demonstrated no effect on nitrogen-fixating bacteria following glyphosate application (Muller et al., 1981). In fact, some microorganisms are known to degrade glyphosate (Rueppel et al., 1977; Quilty and Geoghegan, 1976). Other studies have reported effects at low concentrations (e.g., 1 ppm; Jaworski, 1972; Grossbard, 1974), while others indicated no effects at high concentrations (e.g., 100 ppm; Torstensson, 1989; Marsh et al., 1977). Any impairment of bacteria from use under the permit would be localized to the railroad tracks and the right-of-way, which do not provide habitat for the majority of organisms. Therefore, localized short-term impairment of bacteria or other types of fungi is not anticipated to impact either humans or ecological communities or the ecosystem.

Muller et al. (1981) demonstrated that no nitrogen fixation inhibition was reported in Scandinavian agricultural soils.

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**43. Comment Summary:**

Glyphosate and its degradates are likely to impact the endangered Cook Inlet Beluga Whale by migrating into nearby water ways and contaminating food sources and beluga breast milk.

**Response:**

See response to Comment Summary 15. Since surface water bodies will not be impacted, transport to Cook Inlet will not occur. No exposure to whales is expected.

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**44. Comment Summary:**

Studies show that glyphosate disrupts DNA transcription in sea urchins (Marc, 2005).

**Response:**

The cited study states that sea urchin hatching and RNA transcription could be impacted by Roundup. It also states that pure glyphosate had a weak effect on hatching (page 4).

Since surface water bodies will not be impacted by the proposed application, transport to marine waters will not occur. No exposure to sea urchins is expected. See response to Comment Summary 15.

=====

**45. Comment Summary:**

Several comments were received that focused on habitat impacts or non-target species. These included the following:

- Glyphosate use will reduce songbird density.
  - Glyphosate use will harm small mammal and bird populations by damaging food supplies and habitat.
  - Glyphosate can reduce browse for moose, elk, and deer.
  - Glyphosate has adverse effects on beneficial insects including pollinators, earthworms and other soil aerators, predators, soil producers, and microorganisms.
- (Springett, 1992; MacKinnon, 1993; Santillo, 1989; D'Anieri, 1987)

**Response:**

As with humans, in order for wildlife or bird to be adversely impacted, there must be both a complete exposure pathway which could lead to a dose, and there must also be toxicity significant enough to cause an adverse reaction.

Pesticides will be applied close to the ground by a slow moving vehicle during periods of low wind, which will prevent significant aerial drift during application. Glyphosate adsorbs strongly to soil particles, and is either taken up by plants or degraded by microorganisms, making it unavailable for dispersion after application. Any potential exposure would be limited to the immediate application area. Since the affected vegetation dies, there is minimal opportunity for birds or wildlife to consume contaminated vegetation.

This product has been extensively studied and its low toxicity has been documented across many species in multiple studies. Glyphosate works by inhibiting an enzyme that enables the plant to produce proteins necessary for plant growth and survival. The enzyme and protein production process are found only in plants, not in animals, which limits the effects of glyphosate herbicides on organisms other than plants (US Forest Service, 2000; Williams, 2000).

Given the lack of mobility of glyphosate in a cold environment (Roy et al., 1989), any impacts on plants, insects, or microorganisms would be limited to the immediate application areas, which include only the tracks and its right-of-way, and does not include the surrounding habitats. As a result, no habitat impacts on non-target species are anticipated in areas containing viable habitat.

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**46. Comment Summary:**

The proposed chemicals will bioaccumulate.

**Response:**

Glyphosate has been shown to not bioaccumulate in animals – instead it is excreted unchanged (US Forest Service, 2000).

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**47. Comment Summary:**

Dying vegetation will change the oxygen level in the water, which will kill fish.

**Response:**

See response to Comment Summary 15. Since surface water bodies will not be impacted, no effects on oxygen levels in water or fish are expected. Pesticide will not be applied within 25 feet of any surface water body. Therefore, there will be no vegetative that may decompose in the water.

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**48. Comment Summary:**

Several comments expressed concern over impacts to endangered species. Statements included:

- The National Marine Fisheries Service found that pesticides are likely to jeopardize endangered and threatened species, including salmon and steelhead, and impact critical habitat.
- Application of glyphosate directly impacts salmon and steelhead, contrary to stipulation in the Endangered Species Act.

**Response:**

There are no federally listed endangered or threatened species habitats in or near the proposed spray area, nor is glyphosate expected to migrate off-site. Salmon are not considered threatened or endangered in Alaska.

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**49. Comment Summary:**

Several comments related to concern about effects from other ingredients in AquaMaster. Statements included:

- AquaMaster contains many unknown ingredients.
- The other ingredients in glyphosate products, especially polyethoxylated tallow amine (POEA), are even more toxic than glyphosate itself.
- Inert ingredients are toxic to aquatic organisms.

(Cox, 2006)

**Response:**

The chemical composition of the herbicide AquaMaster is known. It contains only glyphosate and water (Bayer, 2008). POEA, commonly found in Roundup and other glyphosate formulations, is not present in the proposed herbicide.

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**50. Comment Summary:**

Several comments expressed concern related to adjuvants. Statements included:

- The chemical content of Agri-Dex is considered proprietary information, so there is not enough information about what is in it.
- EPA has not evaluated the use of glyphosate with this surfactant.
- There is a lack of scientific data on the ecological, toxicological, and health effects of adjuvants.
- Adjuvants are often more toxic than pesticides.
- Agri-Dex is toxic to fish.
- Agri-Dex contains at least two chemicals that are likely to cause cancer, including ethylene oxide and 1,4-dioxin (1-4 dioxane).
- Surfactants contain known carcinogens including dioxins.
- Agri-Dex will enhance the toxic effects, bio-accumulation, and persistence of the herbicide.
- Adjuvants should be subject to the same level of review and analysis as pesticides. (Abdelghani, 1997; Bakke, 2007; Bayer, 2008; Diamond, 1997; Howe, 2004; Krogh, 2003)

**Response:**

Agri-Dex is a widely available product and has a long history of use with glyphosate under similar conditions to those proposed under this permit.

Toxicological data on the adjuvant Agri-Dex indicate that it has very low toxicity. Although some spray adjuvants can present substantial toxicity, such as the adjuvants in Roundup, Agri-Dex is considered “practically nontoxic” based on scientific studies on its toxicity to fish (Hughes, 2009). The aquatic LC50 (concentration lethal to 50% of exposed organisms) concentrations for Agri-Dex are in the range of >1,000 milligrams per liter (mg/L).

Based on the chemical content, Agri-Dex has low water solubility (Bayer, 2008), indicating bioaccumulation is unlikely. It also has a high soil sorption capacity, indicating low mobility and persistence, which will reduce potential exposure (Krogh et al., 2003).

Dioxins are generally not present in surfactants. However, 1,4-dioxane, which is used as a stabilizer in some solvents, may be present in some surfactants. 1,4-Dioxane is not carcinogenic like dioxins. It is volatile, not persistent, and has a much lower toxicity than do dioxins. It does have effects on the thyroid.

Agri-Dex is approved for aquatic use by Washington State, which conducts reviews to ensure that adjuvants are not expected to be sources of water contamination. The State of Washington requires manufacturers of adjuvants to provide information on the specific contents of adjuvants, and conducts a review of documentation and acute toxicology studies for each product and its specific constituents for potential toxicity before allowing registration. These studies and analyses are based on proprietary information and are not available for outside review. However, DEC frequently relies on Washington’s process to determine which adjuvants can be safely used. DEC supports the use of Agri-Dex for the proposed use under this permit application.

Synergistic effects, in which the combined effect of the chemicals is greater than their individual toxicity, can occur with exposure to multiple chemicals. However, so can antagonistic effects, in

which the combined effect of the chemicals is less than their individual toxicity. It is extremely difficult to predict such effects in the environment, or to evaluate every single potential combination of adjuvant and pesticide. This is why the EPA registration evaluation process incorporates a significant margin of safety.

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**51. Comment Summary:**

Glyphosate has an antagonistic effect on the toxic action of a surfactant (Mensink, 1994).

**Response:**

In an antagonistic effect, the combined effect of the chemicals is less than their individual toxicity. It is extremely difficult to predict such effects in the environment, or to evaluate every single potential combination of adjuvant and pesticide. This is why the EPA registration evaluation process incorporates a significant margin of safety.

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**52. Comment Summary:**

The selected applicators have a poor safety record. Statements included:

- The DeAngelo Brothers have a poor safety record.
- Applicators should be required to provide records of all violations, citations, fines, and court suits for public review.
- The DeAngelo Brothers do not have sufficient insurance coverage to pay for damages that might occur, and therefore the ARRC should be required to obtain a bond to cover potential damages
- The ARRC must be required to select a different contractor to apply pesticides.
- The DeAngelo Brothers have received numerous fines and violations. (ODEQ, 2009; Timm Adams vs. Dupont; USA vs. Horne et al.)

**Response:**

The permit requires that individuals applying herbicides under the permit be certified in the State of Alaska to perform the work, and that the employer have a liability insurance policy of not less than \$500,000 per person for bodily damage and not less than \$300,000 per incident property damage. Proof of liability insurance is required, and was provided, in the pesticide use permit application. Regulations do not allow DEC to stipulate which contractor can be used.

DEC has periodically overseen herbicide application activities conducted by DeAngelo Brothers. Memoranda regarding these observations document safe, knowledgeable, and competent applicators, and correct application of pesticides.

Furthermore, DEC will continue to periodically oversee herbicide application activities under this permit. Any failures to comply with either the herbicide label or the permit will result in enforcement action by DEC.

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**53. Comment Summary:**

ARRC has shown that they are careless and neglectful, and they cannot be trusted to follow requirements.

**Response:**

DEC will periodically inspect the herbicide application activities while they are occurring. Any failure by ARRC to comply with either the herbicide label or the permit will result in enforcement action by DEC.

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**54. Comment Summary:**

Significant rainfall occurred prior to, and following application of herbicide made by the ARRC in July, 2010 under a previous permit. This violates the direction on the label and demonstrates the carelessness of the ARRC.

**Response:**

The pesticide product label specifies that the product may need to be re-applied if heavy rainfall occurs soon after application. The permit under which the ARRC applied herbicides in July, 2010 (#10-SOL-01) specified that pesticides may not be applied during heavy rainfall.

A DEC pesticide enforcement officer was on hand to observe the application made on July 25, 2010, and wrote a detailed description of observations made during the application. The observation Memorandum notes that rainfall did occur prior to the application, but specifically states that rainfall had ceased, and vegetation had dried by the time application began. The observation also notes that a light rain was falling during some periods of the application. These conditions meet both the label requirements and the permit stipulations.

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**55. Comment Summary:**

The use of herbicides will disturb the soil, or leave bare soil, which will encourage more weed growth (Ministry of Environment, British Columbia).

**Response:**

Vegetation within the target application site is prohibited by FRA regulation, therefore all vegetation must be eliminated.

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**56. Comment Summary:**

Similar applications of this herbicide made by the ARRC in July, 2010 sprayed in close proximity to water bodies, including creeks and the Snow River.

**Response:**

A DEC pesticide enforcement officer was on hand to observe the application made on July 25, 2010, and wrote a detailed description of observations made during the application. The



observation Memorandum notes that ARRC staff were conscientious about spotting and marking temporary surface water, and made several revisions to the pre-marked spray areas, including at the Snow River area, to ensure that the required buffer was maintained where water appeared to be rising.

DEC is satisfied that ARRC staff maintained the required buffer from all surface water during this application.

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**57. Comment Summary:**

There is substantial and ongoing opposition to the use of herbicides on the railroad. Many communities, groups, and individuals have written or passed resolutions in opposition to pesticide use.

**Response:**

DEC recognizes that some individuals have strong opinions regarding the use of herbicides, and acknowledges these concerns. However, decisions about whether or not to issue a pesticide use permit must be based on a determination of whether unreasonable adverse effects are anticipated as a result of the permitted action.

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**58. Comment Summary:**

Weeds in agricultural areas have become glyphosate resistant (Price, 2011).

**Response:**

Long-term, chronic use of these products is not proposed under the current permit application. No resistant plant strains are anticipated to develop under occasional use of the chemical.

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**59. Comment Summary:**

Very little is known about the long term effects of glyphosate on the environment.

**Response:**

Characteristics and behavior of glyphosate products have been widely studied and are well understood. Preliminary data from studies conducted in Alaska provide substantial documentation that the behavior of the proposed products, including persistence and mobility, do not vary significantly from that in warmer climates.

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**60. Comment Summary:**

The EPA has received a request from a manufacturer to cancel the registrations of two glyphosate products. This indicates that manufacturers doubt the marketability of glyphosate in the future. (EPA, 2012)

**Response:**

The manufacturers of the referenced products submitted a voluntary cancellation notice to EPA. Manufacturers may choose not to continue to register pesticide products with the EPA for a wide variety of reasons, including discontinuation of a product line, transfer of company ownership, or other reasons. This activity is a common occurrence, and has no significance related to the future use of glyphosate.

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**61. Comment Summary:**

The ARRC is applying for permits for small sections at a time to avoid attracting public notice of the herbicide program.

**Response:**

Each pesticide use permit application is evaluated individually to determine if it could cause unreasonable adverse effects.

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**62. Comment Summary:**

This permit would open the door to more toxic herbicides being used in the future.

**Response:**

Each pesticide use permit application is evaluated individually to determine if it could cause unreasonable adverse effects. Speculation on future use of other herbicides goes beyond the scope of this permit determination.

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**63. Comment Summary:**

The warning label for glyphosate in the United Kingdom is much stronger than in the United States.

**Response:**

The EPA evaluation and registration process is discussed in detail in the Introduction of this Responsiveness Summary and in the Decision Document. EPA assessments are designed to over predict toxicity and risk. DEC feels that the EPA evaluation and registration process is adequate to protect human and ecological health for the proposed products.

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**64. Comment Summary:**

Application of the product is restricted to wind speeds between two and ten miles per hour. These conditions are rarely met in some of the application areas.

**Response:**

The product label does not specify any restrictions related to wind speeds for ground applications. However, the permit will stipulate this requirement as an added precaution against off-target drift. This requirement may decrease the potential days and times when pesticide may be applied under this permit.

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**65. Comment Summary:**

Are the risks of applying the chemical outweighed by need of, and benefit from, the application?

**Response:**

In its decision, DEC considers whether the proposed pesticide use complies with requirements of Title 18, Chapter 90 of the Alaska Administrative Code (18 AAC 90), and whether the proposed use could result in an unreasonable adverse effect, including an unreasonable risk to human, animals, or the environment, taking into account the economic, social, and environmental costs and benefits of the use of a pesticide.

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**66. Comment Summary:**

Spills, improper application, weather issues, and operator error are inevitable, and will result in contamination.

**Response:**

Application of glyphosate as outlined in the permit application should not lead to a release causing acute or chronic damage to the environment. Glyphosate is relatively non-toxic compared with other pesticides or transported chemicals. In addition, glyphosate is relatively immobile and not persistent.

The requirement for a certified applicator to handle the products under the permit application provides further assurance that the hazards of the products will be known, and that label and permit application requirements will be followed for application, storage, and disposal of products and containers.

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**67. Comment Summary:**

On a field trip in June, 2009, a DEC staff member identified six areas that contained water, snow, or the potential to transport pesticides to waters of the state. The spray areas for permit #10-SOL-01 were not modified based on this information.

**Response:**

Both the Pesticide Program and the Division of Water from DEC participated in the June, 2009 observation of the spray areas proposed under #10-SOL-01. The Pesticide Program developed a Memorandum to describe observations, and the Division of Water developed an inspection report. The Division of Water report specifically notes that the division of track into spray-areas and non-spray-areas was well estimated, and that the eyeball approach to ensuring water fluctuations was a ‘reassuring’ approach to ensuring the buffer was maintained. The Pesticide Program Memorandum noted that none of the proposed spray areas contained permanent water bodies within 100 feet.

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**68. Comment Summary:**

The argument that pesticides are needed to control vegetation for safety reasons is false because the ARRC has an excellent safety record.

**Response:**

FRA has established a reasonable justification that current methods of controlling vegetation are not adequate.

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**69. Comment Summary:**

The proposed product may not adequately control vegetation.

**Response:**

Glyphosate has a long history of safe and effective use in eradicating vegetation. It is one of the most widely available and widely used herbicides.

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**70. Comment Summary:**

Similar applications of this herbicide made by the ARRC in 2010 under a previous permit were not effective.

**Response:**

A DEC pesticide enforcement officer inspected the treated areas one month after application of pesticides made under pesticide use permit #10-SOL-01, and wrote a detailed description of observations. The observation Memorandum, supported by photographs, notes that there was a clear line of demarcation along the edge of the spray area; most vegetation within the spray area was dead or browning, and vegetation outside of the sprayed areas was green and showed no signs of pesticide impact. Observations were made in the Seward Railyard and at several locations along the right-of-way. All areas observed showed the effects of the herbicide, limited to the sprayed area.

It should be noted that many of the approved areas were not sprayed, due to presence of water, track conditions, or other reasons; these areas did not show any effects from herbicides.

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**71. Comment Summary:**

There is great aesthetic and quality of life value to living in an area that is free from pesticide use.

**Response:**

The proposed pesticide is readily available and widely used by property owners in many areas of Alaska. Denial of this permit will not provide assurance that an area is pesticide free. DEC considers the social and economic costs and benefits in determining whether a proposed pesticide use permit poses an unreasonable adverse effect.

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## 72. Comment Summary:

The proposed project will harm the state's tourism and commercial fishing by damaging the perception of Alaska as a pristine environment.

### Response:

DEC considers the social and economic costs and benefits in determining whether a proposed pesticide application poses an unreasonable adverse effect. DEC believes that there is a greater potential cost to tourism if herbicide is not used, due to the sanctions likely to be imposed by FRA. DEC does not believe that this limited application of herbicide will have a significant impact on tourists' perception of Alaska and whether they will or will not travel to Alaska, or on consumer's perception of Alaskan fish products.

## 73. Comment Summary:

There has been insufficient time to evaluate effects from the Seward to Indian permit (10-SOL-01). There need to be studies and measurements taken from that application.

### Response:

A DEC pesticide enforcement officer inspected the treated areas one month after application of pesticides made under pesticide use permit #10-SOL-01. A detailed observation Memorandum, supported by photographs, notes that there was a clear line of demarcation along the edge of the spray area; most vegetation within the spray area was dead or browning, and vegetation outside of the sprayed areas was green and showed no signs of pesticide impact. Observations were made in the Seward Railyard and at several locations along the right-of-way. There has been no evidence of pesticide impacts outside of the treatment area under this permit.

Characteristics and behavior of glyphosate products have been widely studied and are well understood. Local studies have provided data that indicates the behavior of the proposed products, including persistence and mobility, does not vary significantly from that in warmer climates.

DEC does not feel that additional information regarding the proposed products is necessary to make a determination.

## 74. Comment Summary:

The ARRC has not considered the liability, clean up costs, and monitoring required if herbicides contact groundwater (Tilsworth, 1991).

### Response:

Pesticide is not expected to migrate to groundwater as a result of this project. Glyphosate adsorbs strongly to soil particles, and is either taken up by plants or degraded by microorganisms, making it unavailable for dispersion after application. Water and sunlight are not a significant degradation pathway for glyphosate, but it is readily, and fairly rapidly, broken down by microorganism in soil and water. Once in the soil, it degrades relatively rapidly and is not

considered to be persistent. These characteristics make it unlikely to be transported or to leach through soil to groundwater.

The pesticide applicators must have a liability insurance policy of not less than \$500,000 per person for bodily damage and not less than \$300,000 per incident property damage.

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**75. Comment Summary:**

The railroad fact sheet “Glyphosate – Frequently Asked Questions” is inaccurate, outdated, and based on very few peer-reviewed scientific journals.

**Response:**

DEC did not rely on the railroad fact sheet to make decisions about whether to issue or deny the permit. DEC conducted a thorough independent review, as outlined in the Decision Document.

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